

PAT 00 373 DE

**What is claimed is:**

1. A process for producing multicoat color and/or effect paint systems comprising
  - 5 (A) at least one primer,
  - (B) at least one color and/or effect basecoat, and
  - (C) at least one clearcoatby
  - 10 (I) applying at least one pigmented or unpigmented primer (A) curable thermally and with actinic radiation to a substrate to give at least one primer film (A),
  - (II) exposing the primer film(s) (A) to actinic radiation to give at least one partially cured primer film (A) which can still be thermally cured,
  - 15 (III) applying at least one pigmented coating material (B) curable thermally and/or at least one pigmented coating material (B) curable thermally and with actinic radiation to the outer surface of the partially cured primer film(s) (A) to give at least one pigmented film (B) which can still be cured thermally or both thermally and with actinic radiation,
  - 20 (IV) exposing the film(s) (B) curable thermally and with actinic radiation to actinic radiation to give at least one partially cured film (B) which can still be thermally cured,
  - (V) applying at least one clearcoat material (C) curable with actinic radiation and/or at least one clearcoat material (C) curable thermally and with actinic radiation to the outer surface of the film(s) (B) to give at least one clearcoat film (C) curable with actinic radiation and/or at least one clearcoat film (C) curable thermally and with actinic radiation,
  - 25 (VI) exposing the clearcoat film(s) (C) curable with actinic radiation and/or thermally and with actinic radiation to actinic radiation to give at least one clearcoat cured with actinic radiation and/or at least one partially cured clearcoat film (C) which can still be thermally cured, and
  - 30 (VII) subjecting the primer film(s) (A), the pigmented film(s) (B), and the still thermally curable clearcoat film(s) (C) to joint thermal curing.

2. The process of claim 1, wherein motor vehicle bodies and mounted components thereof are used as substrates.
- 5 3. The process of claim 2, wherein the mounted components are of SMC, BMC, IMC or RIMC.
4. The process of any of claims 1 to 3, wherein the primer (A) comprises
  - (a1) at least one constituent containing
    - 10 (a11) on average per molecule at least two functional groups containing at least one bond which can be activated with actinic radiation and which serves for crosslinking with actinic radiation, and if desired
    - (a12) at least one isocyanate-reactive group,
  - 15 (a2) at least one thermally curable constituent containing at least two isocyanate-reactive groups,  
and
  - (a3) at least one polyisocyanate.
- 20 5. The process of claim 4, wherein the isocyanate-reactive groups (a12) are selected from the group consisting of hydroxyl, thiol, primary and secondary amino groups, and imino groups.
6. The process of claim 4 or 5, wherein the functional groups (a11) are selected
  - 25 from the group consisting of carbon-hydrogen single bonds or carbon-carbon, carbon-oxygen, carbon-nitrogen, carbon-phosphorus or carbon-silicon single bonds or double bonds.
7. The process of claim 6, wherein the functional groups (a11) are carbon-carbon
  - 30 double bonds ("double bonds").
8. The process of claim 7, wherein the double bonds are present in (meth)acrylate, ethacrylate, crotonate, cinnamate, vinyl ether, vinyl ester, ethenylarylene, dicyclopentadienyl, norbornenyl, isoprenyl, isopropenyl, allyl

or butenyl groups, ethenylarylene ether, dicyclopentadienyl ether, norbornenyl ether, isoprenyl ether, isopropenyl ether, allyl ether or butenyl ether groups, or ethenylarylene ester, dicyclopentadienyl ester, norbornenyl ester, isoprenyl ester, isopropenyl ester, allyl ester or butenyl ester groups.

5

9. The process of claim 8, wherein the double bonds are present in acrylate groups.

10

10. The process of any of claims 3 to 9, wherein the functional groups (a12) are hydroxyl groups.

15

11. The process of any of claims 3 to 10, wherein the constituents (a2) are selected from the group consisting of linear or branched, block, comb or random oligomers or polymers.

20

12. The process of claim 11, wherein the oligomers and polymers (a2) are selected from the group consisting of (meth)acrylate (co)polymers, polyesters, alkyds, amino resins, polyurethanes, polylactones, polycarbonates, polyethers, epoxy resin-amine adducts, (meth)acrylate diols, partially hydrolyzed polyvinyl esters, and polyureas.

25

13. The process of any of claims 4 to 12, wherein the ratio of isocyanate groups to the sum of the isocyanate-reactive functional groups in the primer (A) is  $< 1.3$ .

30

14. The process of any of claims 4 to 13, wherein the thermally curable constituent (a2) has a molecular weight polydispersity (mass-average molecular weight  $M_w$ /number-average molecular weight  $M_n$ ) of  $< 4$ .

15. The process of any of claims 4 to 14, wherein in the dual-cure primer (A) the ratio of solids content of constituents curable with actinic radiation (UV) to solids content of thermally curable constituents (TH), viz. (UV)/(TH), is from 0.2 to 0.6.

16. The process of any of claims 4 to 12, wherein the thermally curable constituent (a2), based on its overall amount, has an aromatic structural unit content of < 5% by weight.